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ABSTRACT

Academic research funds increased more rapidly than enrollments between 1950 and 1970 but little analysis has been made of the educational effects of the change. In part this is due to an assumption that benefits to education flow automatically from funding for university-based research. As a result most studies of graduate study report only dollar outcomes in terms of student support, facilities, or service. Recent work in the sociology of science has identified the importance of networks of communication, recognition, and visibility for the active scholars. The concept of awareness is adapted here to the assessment of student perceptions of the research activity around them. The notion is operationalized in two ways, by recognition and by association. It is concluded that awareness is a discrete and useful concept in this application, that it reveals about twice the level of involvement with research established by other methods, and that departmental policy plays a larger role than the characteristics of the field of knowledge in determining the educational consequences of research activity. (Author)

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AWARENESS OF AMBIENT RESEARCH AMONG DOCTORAL STUDENTS AT A MAJOR RESEARCH UNIVERSITY

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AWARENESS OF AMBIENT RESEARCH AMONG DOCTORAL STUDENTS AT A MAJOR RESEARCH UNIVERSITY[1]

William Toombs

The increase in academic research over the last two decades has exceeded the rate of change for other educational indicators such as enrollment, but its consequences for the educational experience have had far less attention and analysis.[1] Data from the period 1960-70 have been gathered systematically by several agencies and they point up the distinction. Degree credit enrollments at colleges and universities increased by a factor of 2.2, faculty and staff by 1.5, and the annual output of doctoral degrees by about 3.0 (USOE 1972). In that same ten-year span the identified dollar value of research and development funds used annually by institutions of higher learning increased by a factor of 3.5 and the federal share of those expenditures was multiplied 4.1 times (NSF 1973). Largely unidentified are the informal inputs of faculty time and usage of institutional equipment. Since 1969 the patterns of funding have changed and growth rates have slowed, but the nation's total investment in academic research remains high.

The origin of the modern academic research era in the U.S. is singularly clear. The report developed by committees under the leadership of Vannevar Bush (1945), published as *Science, the Endless Frontier*, established the project system as the characteristic mode of American academic research. Even in retrospect the document is remarkable for its force, recommending that the Federal Government assume leadership in the "creation of new scientific knowledge and development of scientific talent." The statement embodied the experience with science in the war years and reflected the urgent need for expertise in many quarters of national life. The academic community was

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viewed as a fundamental component contributing through, "centers of basic research which are principally in the colleges, the universities, and research institutes" and through "men and women trained in science." The success of this general approach has been widely acknowledged and specifically identified by Ben-David (1968, 1972), ". . .
since World War II United States effort has greatly surpassed that of Europe. Investment both in science and education is much higher . . . As a result there are comparable differences in the 'stock' of highly trained manpower . . . not only did the United States performance surpass that of Western Europe in an extensive type of higher ecuation and applied research but also in research of higher quality."

Commenting on the National Science Foundation Dr. Bush (1970) observed, ". . . the job has been well done. We've had no scandals, we've had no tendency of the Federal Government to dominate the universities, and we've handled the allocation of funds on the basis of the judgment of the scientists themsleves."

SOME VISIBLE ASSUMPTIONS

One point was not fully treated in the landmark report, however; the nature of the relationship between research activity and education. The assumption that emerged from the work of the Moe Subcommittee was that increased funding for research carries with it, *ipso facto*, educational benefits that need not be identified or examined separately. This assumption was carried forward by its plausibility through two decades. Intuitively, we recognize that research activity keeps faculty in touch with developing knowledge and methodology, adds timeliness to teaching, enriches the learning environment of the advanced student and eventually finds its way into the everchanging curriculum. Analysis of these effects has been quite limited for stipulating any of the multiple impacts has proven to be surprisingly difficult. Today, with a national policy for science under debate, the need for careful cost allocation apparent on every campus, and the requirement to justify every degree program standing high on the agenda of every allocative body, the question of how research relates to education has new

urgency. Just beyond lies the deeper question of how academic research can be sustained by public interest if student participation decreases (Kaysen, 1969).

One fundamental step in meeting these questions requires identification of the relationships advanced graduate students hold with the ongoing research activities in the university. Several indicators are presumed to reflect what the research enterprise transmits to the graduate student, but they are acknowledged to be crude. The proxy of student support in the form of a research assistantship or part-time employment has been taken as one evidence of involvement with research. Berelson (1960, 1965) estimated that 20-25,000 graduate students held assistantships, ". . . half the estimated total of all doctoral students," basing his assessment on the ratio of one assistantship to every $10-12,000 of research funds. Heiss (1970) reported that 33% of the respondents to an extensive survey of major university populations held or had held a research assistantship but noted ". . . it is not unusual for a student to assist a professor with his research for the purpose of gaining experience and contacts with active researchers in his field." The National Research Council summary of current doctorates for three recent years shows the following percentage of doctorate recipients identifying research assistantships as a source of support in graduate school, (1968, 37.3%); (1970, 36.8%); (1973, 34.5%). A Stanford University (1972) study of its graduate programs identified 38% of the students as holding research assistantships. Creager (1971), reported 20.6% of Ph.D. students participating in research assistantships in a given year. Calvert, et al., (1972) show about one-fourth of those in science and engineering on research assistantships. In a detailed study of the impact of federal funds for science on one state, Michigan, Dressel and Come (1969), found 28% of the doctoral students holding

research assistantships. They also made an attempt to reach the deeper effects by asking what type of support contributed most to professional development. Research assistantships were identified by 36%, the plurality of responding students; teaching assistantships stood next at 26%. Worthen (1968), focused more closely on the research assistantship and found that the quality of involvement with research was significant for later research productivity. Others studying the effects of holding an R/A have found lower dropout rates but some delays among those students (Tucker, 1967).

A second common indicator of educational effects at the doctoral level takes degree output as evidence. Sawyer (Strickland 1968) estimated that one-half of the dissertations accepted in 1966 at the University of Michigan were the outgrowth of sponsored research. Consolazio (1967), reported, "On the average, approximately $1 million of Federal funds is associated with the award of seven doctorates in science and engineering." The conclusion is based on a consideration of the relationship between research funding and doctoral output at several kinds of universities during the post-war period. In selecting degree output as a basic measure Breneman (1970) makes an important distinction. "Universities are engaged in two closely related but conceptually separable activities, education and certification. By defining degrees as the output measure we are explicity concentrating upon the university's role in certification as opposed to education."

Underlying many of these studies is an assumption that a linear "production process" is operating in academic research. Successful proposals produce funded research projects which generate knowledge and, as a related but incidental outcome, provide support for graduate students and an output of advanced degrees. Studies of these incidental outcomes, however complete they may be, follow what might be called a "dollar trace." They reveal

comparatively little of the relationship between academic research and the process of graduate education. There is a strong likelihood that preoccupation with such outcomes has produced an understatement of the educational significance of academic research as distinct from its contributions to knowledge. Research that reaches the project stage is only a small part of the total inquiry and speculation that infuse the university environment which students as well as faculty inhabit. Holders of graduate fellowships or other support that require no duties may be as deeply involved with research activity as any research assistant. Students holding no appointments that carry a research tag may also be voluntary participants in the research life of a department. In a search for concepts, techniques, and data to advance doctoral work a graduate student may examine and reject a variety of options used by the researchers around him. On the other hand, holders of research assistantships may, by those commitments, be restricted from full contact with other lines of inquiry. In summary, answers to these kinds of educational uncertaintes cannot be deduced from a simple analysis of outcomes, particularly dollar outcomes.

AN ALTERNATE APPROACH

In contrast to the production notion this study begins with the retrospective perceptions of doctoral students in order to examine some of the educational interactions of graduate study and research.

To develop such an approach certain concepts generated by work in the sociology of science offer a starting point. In exploring the larger scientific community these studies have focused on communication networks among active scientists and on the informal social processes in the disciplines and subdisciplines (Menton 1973). By treating concatenated relationships rather than linear interactions a richer view of events is attained.

Occasionally in these studies specific notice is taken of the graduate student. Hagstrom (1965) in his fundamental work observed that the incorporation of students presented ambiguities of authority among collaborative researchers and required certain organizational adjustments. Crane (1972) notes ". . . the most important indicators of social organization in a research area are informal discussions of research, published collaborations, relationships with teachers, and the influence of colleagues upon the selection of research problems and techniques." Graduate students at the doctoral level are initiates into these "invisible colleges" (Crane 1972) within the disciplines. They are being socialized to the larger scholarly community and can be expected to exhibit sensitivity to those "indicators." Awareness of this ambience in one aspect, research, is examined here as one line of relationship between academic inquiry and educational experience at the doctoral level.

AWARENESS

Two aspects of awareness are developed, "recognition" and "association." The first is objective in nature, the second, subjective.

Merton (1957) developed some fundamental dimensions of what is called "recognition" in this study around the idea of, "Visibility . . . is the extent to which the structure of a social organizaiton provides an occasion to those variously located in that structure to perceive the norms obtaining in that organization and the character of role-performance by those manning the organization." The obverse of visibility was defined by Merton as "observability." In studies of communication among scientists Cole and Cole (1968) defined the concept more fully, "Visibility characterizes the men being looked at; awareness, the men who are looking."

Interpersonal perceptions among men of science were under study in these cited materials. The modification introduced for the purposes of this

study emphasizes, not the process, but the product of their work, research projects. And it is the "awareness" of graduate students at the doctoral level rather than of fellow scientists we are concerned with. One means of assessing the degree to which doctoral students are aware of ambient research activity is through their "recognition" of projects. A second method is to focus on the interrelationship of student and research environment then simply ask the student for a self-ascription of his "association" with research.

THE SETTING

To conduct an initial study of these notions of awareness it would be advantageous to have a "high probability" setting in which successful doctoraal students are exposed to a research-rich environment. This set of conditions can be established by questioning recipients of the Ph.D. who carried on their work during the years of generous funding for fellowships, and research activity, 1960-69, at an institution ranked among the top five research universities. At the University of Michigan a sample of 664 graduates, all PhD.'s from each of 18 departments selected as representative of humanities, science, and engineering was drawn from the 1,889 persons who received advanced degrees between December 1966 and January 1970. Three mailings of a survey document which included questions on the socialization process as well as the items reported here brought usable responses from 470 individuals, 68% of the sample. When non-respondents were compared with respondents using independent data from the NAS-NRC "Survey of Current Doctorates" and they differed significantly on foreign residence and citizenship but not on age, elapsed time from baccalaureate to doctorate, or previous professional experience (Toombs, 197_).

RECOGNITION

To assess awareness in terms of recognition each recent recipient of the Ph.D. was presented with a means of prompting recall of research activity.

For every department a list of all major sponsored projects recorded by the research administration office was developed. The active terms of these projects 1964 to 1970 cover the approximate span of time during which the subjects pursued doctoral work. Each project listing carried the name of the principal investigator, a descriptive title, and the sponsor. [A typical listing read "8154 Goddard E. W. - Radio Isotope Dating of Rocks NSF."] Because the academic environment includes much research beyond funded projects, respondents were asked to add other projects, sponsored or unsponsored that were judged "important to your work." By this means projects not yet funded or in the realm of personal inquiry could be added to the list. Recognition scores are displayed, by department, in Table 1.

[Table 1 about here]

Among the 470 respondents a total of 328 (69.8%) individuals recognized one or more discrete research projects. The mean number of recognitions per student for the sample group was 7.4 projects. For each individual the number recognized was converted to a percentage of the projects listed in his department to give a recognition level. The mean proportion of recognitions, the recognition level, was 22.7% suggesting a generalization that doctoral students are specifically aware of about one-fifth of the ambient research activity. Across the major divisions of knowledge, this recognition level is quite similar. Between the disciplinary departments in any division there is considerable variation. In the natural sciences the range is extreme with mathematics showing the lowest level of recognition, 5%, and astronomy, geology, and botany among the highest. The social sciences show a similar variability among departments. These date indicate that the source of variability arises from intradepartmental factors. In some cases such factors are artifacts of the discipline itself. Where sub-disciplines are specialized and tightly structured (Hagstom 1974), where highly concentrated techniques require detailed preparation, or where there

TABLE I

Recognition of Research Projects:
By Department and Division

Div. & Department	N = (A)	Number of Projects Listed	Number of Projects Recognized (B) Per Respondent (C) Mean No.	Mean Prop. (%)	No. Zero (D) Recognitions	Maximum No./(E) Individual
I - Natural Science						
Mathematics	48	43	2.5	5.0	24	22
Astronomy	15	29	13.8	47.6	1	25
Chemistry	39	71	8.8	14.4	7	31
Geology	18	23	9.3	40.6	2	23
Botany	12	38	12.9	34.0	0	24
Zoology	42	81	16.4	20.7	7	45
	174	285	9.7	19.0%	41	
II - Social Science						
Psychology-Clinical	19	12	2.3	19.3	6	6
Psychology-Phys & Ex.	24	42	13.7	32.6	1	30
Psychology-Social	34	36	11.2	31.1	6	26
Anthropology	18	22	4.0	18.2	8	13
Sociology	16	32	9.6	30.3	3	20
Economics	26	34	7.4	21.9	5	18
Geography	8	8	1.8	23.4	3	7
Political Science	21	31	6.5	21.2	7	26
	166	217	8.0	25.4%	39	
III - Humanities						
English	62	3	0.8	28.5	39	3
History	29	6	0.8	13.8	19	4
	91	9	0.8	23.8%	58	
IV - Engineering						
Aero. Engineering	19	45	8.2	18.2	3	19
Mech. Engineering	20	48	10.1	21.0	1	29
	39	93	9.4	20.3%	4	
TOTAL	470	604	7.4	22.7%	142	

is a philosophical schism in the discipline then research activity is less open to student perception.

But the principal source of difference is departmental policy. Brenenman (1970) has analyzed the relationship of the individual faculty priorities and departmental policy in terms of behaviors that maximize prestige. One of these behaviors is control of student access to research and it is treated in a later paragraph of this study. Gratuitous comments of respondents suggest that departments can play an active role in linking research to the educational experience by means of seminars, coffee hours, or exchanges of papers.

Independent knowledge of departmental practices helps explain some of the distinctions. A high proportion of students reported zero recognitions in mathematics, English, and history. In mathematics the low rate of recognition is partly a product of the individualized scholarship typical of the field and partly an outcome of departmental policy by which student support funds from individual projects were pooled for general support of graduate students. No emphasis was given in the department to identifying students with a particular investigation. Interaction across the sub-disciplines was incidental or personal. Conditions in the humanities are harder to explain. It is known that the scholarly output of these departments as reflected by papers and publications is high. These scholars are recognized as eminent by their peers and within the university, and they obtain a large share of intro-mural funds for research. Why so little of this activity was perceived by students is as surprising as it is mysterious.

The importance of adding unfunded projects and other identifiable research activities known to respondents but not on the presented list was emphasized. In all, 67 projects were added by 57 respondents, but only

Three of those additions were in the humanities. The fact that a good share, more than a third (36%) of the respondents in that general field of knowledge did recognize specific research activity adds to the enigma. The socialization process in graduate study depends so heavily upon an environment of open exchange and awareness that this question merits further examination.

VISIBILITY

In that perceptual exchange defined as "awareness," recognition is one side of the coin. If we return to Merton's usage cited earlier then the "visibility" of the project itself is the other. This quality of being observed or identified is a property of the listed projects. Visibility levels are displayed in Table 2. Very few projects were not identified at least once, only 45 out of 604 on the lists. The mean number of identifications was 4.93 per project and the percentage of projects identified in a department ranged from 77.7% to 100%. Characteristics of the projects themselves could be analyzed but our emphasis is on the observers who make the recognitions. [Table 2 about here]

These data on visibility of projects do help us with the question of whether awareness as indicated by recognition is an independent phenomenon. There is a possibility that recognition is no more than a function of the number of projects displayed. Departments were ranked in order of the number of projects listed then ranked by the proportion of projects recognized. When tested by Spearman's rank order correlation the relationship yielded a rho = -.22 not significant.

There is also the question of whether recognition results from an environmental exposure that includes many projects or is simply the product of a few highly visible projects. High recognition could have been achieved under conditions of low visibility if the latter case applied. Even though

TABLE 2

Visibility: Identified Projects by Department & Division

	Number of Projects			Number of Identifications	
	A	B	C	D	E=D A
I - Natural Science	Listed	Identified	% Ident.	Total	Per Proj.
Mathematics	43	36	83.7	99	2.30
Astronomy	29	29	100	189	6.52
Chemistry	71	66	92.9	393	5.54
Geology	23	23	100	165	7.17
Botany	38	37	97.3	163	4.29
Zoology	81	79	97.5	656	8.10
Total	285	269	94.3	1,516	5.84
II - Social Science					
Psychology-Clinical	12	12	100	44	3.66
Psychology-Phys. & Exp.	42	39	92.8	237	5.64
Psychology-Social	36	36	100	329	9.14
Anthropology	22	19	86.3	61	2.77
Sociology	32	30	93.7	144	4.50
Economics	34	34	100	206	6.06
Geography	8	7	87.5	15	1.88
Political Science	31	31	100	132	4.26
Total	217	208	95.8	1,049	4.83
III - Humanties					
English	3	3	100	51	1.70
History	6	6	100	19	3.16
Total	9	9		70	.77
IV - Engineering					
Aero. Engineering	45	35	77.7	146	3.24
Mech. Engineering	48	38	79.1	199	4.14
Total	93	73	78.5	345	3.71
TOTAL	604	559	92.5	2,980	4.93

the relationship between recognition and visibility is pretty clear from an inspection of Tables 1 and 2; a rank order correlation was made between the mean number of recognitions per student (Table 1, column B) and the number of identifications per project (Table 2, column E). Pearson's rho=.83 supports the view that research awareness among graduate students is a function of research ambience in the departmental environment.

There is still a possibility that recognition levels may be influenced or even determined by coexisting or pre-existing factors. For example, more able students may enjoy preferential access to research activity and therefore exhibit high levels of recognition. One indication of high ability, at least at the point of entry into doctoral work, is receipt of a fellowship. Most of these awards are made on the basis of open competition or the considered judgement of a departmental committee. For convenience, recognition levels were trichotomized into NO recognition, LOW recognition to include those below the mean in each department, and HIGH for those at or above the mean. Table 3 displays the primary type of support in the first year of doctoral study reported by respondents at each recognition level. The proportion of those holding fellowships is nearly identical: NO=33%, LOW=35%, HIGH-32%. Even when all types of support were considered no significant differences appeared. Ability, then, as reflected by fellowship holding is not a determinant of recognition in the setting of this study.

[Table 3 about here]

A pre-existing condition such as previous research experience might conceivably give to some students an advantage in awareness of research. Data gathered elsewhere in the study but omitted for the sake of brevity showed no significant difference in previous experience with research between those reporting low levels of recognition and those at the high levels.

TABLE 5

Type of Support Ranked First: by Recognition Level

	1st Year		
	NO	LO	HI
No obligation of time			
Fellowship	33%	35%	32%
Loans & Savings	12	4	10
Spouse's Earnings	22	11	17
Time Commitment			
Teaching Fwp.	23	27	25
Research Asst.	5	20	13
Outside Employment	5	3	3
	100%	100%	100%
N =	134	98	220

(X^2 = 19.77, 12 df, p = .10)

ASSOCIATION

Awareness of research can also be examined through the concept of "association" with research. This involves more subjective judgement. Research was defined broadly for the respondents as "the full range of identifiable investigative efforts, from unfunded scholarly research of the individual professor to foundation sponsored and contract research." The choice of answers was arranged in a partially ordered set in order to gather information on whether the research association was or was not linked to the doctoral dissertation. (Figure 1)

[Figure 1 about here]

The distribution of responses to the four choices is displayed in Table 4. In the total sample, 345 of the 463, 75% reported some association with research. Considered as a whole the distribution of the sample group is surprisingly regular with about a fourth falling into each category. Even the divisions of knowledge show great similarity, humanities standing as the marked exception. Several observations are noteworthy. (a) Association with departmental research is not absolutely indispensable to the preparation of a dissertation even in the natural sciences. (b) Those whose research was "related" to the dissertation are about equal to the group whose research contact was "unrelated." This would seem to indicate no great pressure to work only with the research endeavors that bear upon one's dissertation. (c) While there may be informal pressure toward project-related work it is not visible in the total sample group. Concentration on single project research has generally been noted as the hallmark of engineering but we see in these data an unexpected prevalence in the social sciences. (d) The skewed nature of the humanities responses raises again the questions found in the recognition responses in these fields of study. Again the wording of the question encouraged respondents to consider all types of research, sponsored or unsponsored, personal scholarly effort or institutional

[Table 4 about here]

Figure 1

RELATION TO DISSERTATION	ASSOCIATION WITH RESEARCH: NONE	SOME	SINGLE PROJECT
Related	(Impossible)	Some Related to Dissertation	Single Project Related
Not Related	No Association No Relation	Some Association Not Related	(rare)

TABLE 4

ASSOCIATION WITH RESEARCH: BY DEPARTMENT

	No Association #	%	Some: Unrelated to Dissertation #	%	Some: Related to Dissertation #	%	Related by a Single Project #	%	No Response	TOTAL: Respondents	
Mathematics	19	.39	10	.28	14	.29	4	.08	1	48	100%
Astronomy	0		6	.40	7	.46	2	.13		15	
Chemistry	5	.12	10	.25	15	.38	8	.20	1	39	
Geology	2	.11	6	.33	2	.11	8	.44		18	
Botany	0		4	.33	6	.50	2	.16		12	
Zoology	6	.14	22	.52	11	.26	2	.04		42	
NATURAL SCIENCE	32	.18	58	.33	55	.31	26	.14	3	174	
Psychology-Clinical	7	.36	3	.15	5	.26	4	.21		19	
Psychology-Phys & Ex.	1	.04	6	.25	10	.41	7	.29		24	
Psychology-Social	2	.05	14	.41	4	.11	14	.41		34	
Anthropology	4	.22	4	.22	2	.11	6	.33	2	18	
Sociology	2	.12	2	.12	5	.31	6	.37	1	16	
Economics	4	.15	1	.03	8	.30	13	.50		26	
Geography	1	.12	3	.37	4	.50	0			8	
Political Science	7	.33	7	.33	3	.14	4	.19		21	
SOCIAL SCIENCE	28	.16	40	.24	41	.24	54	.32		166	
History	14	.48	8	.27	4	.13	2	.06	1	29	
English	40	.64	13	.20	9	.14	0			62	
HUMANITIES	54	.59	21	.23	13	.14	2	.02		91	
Aero. Engineering	3	.15	5	.26	1	.15	10	.52		19	
Mech. Engineering	1	.05	8	.40	6	.30	5	.25		20	
ENGINEERING	4	.10	13	.33	7	.17	15	.38		39	
TOTALS	118	.25	132	.28	116	.24	97	.20	7(.01)	470	100%

programs, if the activity had significance for them. The distinctive nature of the research role in the humanities seems to be a product of the discipline.

[Table 5 about here]

Viewed from the standpoint of education there is an important question as to whether those who reported "no association" with research came to that condition by choice. Table 5 displays the answers provided by the 118 subjects in that category. About half the group, 52 individuals, found no research available for student participation. This is a small share of the whole sample, only 11% and it was heavily weighted toward the humanities. The remarkable figure in this table is the small number who did not gain access to existing research even though they desired it.

[Table 6 about here]

An equally interesting question asks what the origins of an association with research were. Much of the thinking about the benefits research carries to the educational process is based on the notion that research is diffused by the normal exchange of ideas throughout the department. It generates a kind of "free good" open to the scrutiny of responsible scholars, including the nascent scholars. Our subjects were asked to designate for each project which was useful to them in their doctoral work the avenue by which they became associated with the activity. Choices were somewhat restricted and the pattern in Table 6 above developed from the answers. Clearly the initiative, the control, of useful association with research projects lies within the project itself, with the investigator primarily but also with others who come into casual contact with the student population. A departmental requirement for research association would have, and does have, little effect. The attraction of earnings is not significant. The two categories which reflect the initiative of the student are low by comparison with those emphasizing faculty control. Taken together these data indicate

TABLE 5

Reasons For No Association with Research:
By Division of Knowledge

	I Nat. Sci.	II Soc. Sci.	III Hum.	IV Engr.	Total
Research not available for student participation	10	6	35	1	52
Research was available but I: -Did not obtain affiliation even though I did desire it	2	3	2	0	7
-Rejected it in favor of more teaching experience	0	5	0	0	5
-Rejected it in favor of more intensive academic exp.	13	4	4	2	23
-Rejected it in favor of employment outside the University	2	4	2	1	9
TOTAL	27	22	53	4	106
No Answer	5	6	1	0	12
					118

TABLE 6
Origins of Association with Research Projects

	Listed Projects				Added Projects			Total Mentions	
	A	B	C	D	E	F	G		(%)
Assigned to Project as Part of Department Requirements	5	1	2	0	0	0	0	8	1.9%
Developed From Casual Contacts with Persons on the Project	42	27	15	6	17	3	1	111	26.9%
Invited to Join by Director or Investigators	56	19	6	5	38	6	1	131	31.7%
Followed up on Classroom or Seminar References	13	5	1	0	3	2	1	25	6.0%
Attracted by the Reputation of Investigator: Sought Connection with Project	31	10	4	1	4	3	0	53	12.8%
Joined Primarily to Supplement Income	11	6	1	1	8	2	0	29	7.0%
Other	21	15	8	0	10	2	0	56	13.6%

*Some respondents checked more than one project. 413 100%

that the idea of open access, however comfortable or traditional it may be, does not fit the facts. This finding also adds one more task, dissemination, to the already long list of responsibilities facing the project director. His actions determine the educational utility of the project and, of course, his actions are abetted or curtailed by department policies which emphasize the importance of, and time for, open presentation of research activity at various stages in its development.

THE AWARENESS CONCEPT

We return now to the basic inquiry into research awareness among doctoral students as a tool for examining the relationship between academic research and education. Awareness has been assessed independently by recognition of research projects and by the kind of association held with research. If these two mechanisms are, in fact, getting at the same attribute then we would expect a degree of correspondence between them. If awareness of research is a discrete attribute then that correspondence should be strong. The distribution of responses in both categories is displayed in Table 7.

[Table 7 about here]

When Goodman and Kruskal's gamma is used as a measure of association a value of gamma=.53 is generated. This comparison is contaminated however by the inclusion of a relationship with the dissertation in the data on association. If the table is collapsed into a simple 2 X 2 display with "none" and "some" as the choices for each measure of awareness a much stronger association emerges giving a Kendall's Q=.96. Put another way if a respondent was "associated" with research at all the probability of being in the "HIGH recognition" group is .61. Thus graduate doctoral students appear to hold a discrete awareness of the research activities in the ambient environment of the department in which they are studying.

TABLE 7

AWARENESS OF RESEARCH
COMPARISON OF RECOGNITION AND ASSOCIATION

Association With Research	Recognition of Research			
		"Some"		
	NO	LO	HI	
No Association	103	3	12	118
"SOME" Unrelated to Dissertation	12	35	85	132
"SOME" Related to Dissertation	17	31	68	116
"SOME" Single Project Association	8	31	58	97
	140	100	223	n=463

Goodman and Kruskal's gamma = .53
Collapsed Table Kendall's Q = .81

CONCLUSIONS

Full assessment of the effects of academic research on graduate education has been hampered by a plausible but incomplete assumption that education gains benefits automatically and incidentally from research projects. By examining some qualitative aspects of the graduate experience through the perceptions of successful students a richer point of view is attained.

1) The awareness students hold of the on-going academic research in a department can be used as a discrete indication of the relationship between inquiry and study. Two different measures of that awareness, recognition and association, yielded similar results. In both cases the proportion of students who acknowledged ties with research were far larger (69.8% by recognition, 75% by association) than the proportions identified by pervious studies (30-40%).

2) One component of the environment in which a doctoral student pursues his or her studies is the research ambience. As measured by recall, students appear to sense about one fifth (22.8%) of the identifiable research. The quality of this ambience appears to be more a product of departmental policy and the decisions of individual researchers than an intrinsic attribute of the field of knowledge. Faculty control access to research and departments control the openness of exchange among researchers and students.

3) Research activity in the humanities does not appear to be interwoven with the educational experience. There are so many unanswered questions in this relationship that firm generalizations will have to wait upon more careful department-based analysis.

This study has suggested that there are tools more effective than simple outcomes measures to assess the quality of the relationship academic research holds to education. Awareness has been established as one useful concept.

Its application, however, raises questions in many directions. The crucial role of the department needs careful study. Perceptions among faculty of the interchange between research and education merit examination. The experience of less successful students, the ABD's, with research need analysis. And, of course, the notion needs testing in other university settings.

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